Calibration Laboratory Assessment Service

Mitutoyo Canada Inc. Calibration Laboratory
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Clients Served: All interested parties.
On-site calibration services are available for the capabilities for which it is indicated in the remarks column.

Field(s) of Calibration: Dimensional and mechanical

SCC Accreditation:
(ISO/IEC 17025) Accredited Laboratory No. 503
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This scope of calibration capabilities is published by the CLAS program of the National Research Council of Canada (NRC) in close co-operation with the PALCAN program of the Standards Council of Canada (SCC), Canada's accreditation body for calibration and testing laboratories. The SCC accredits the capability of the named laboratory for being able to perform the listed calibrations at the given Best Measurement Capability (see Supplementary Notes C and D) with traceability to the International System of Units (SI) or to standards acceptable to the CLAS program.

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
GAUGE BLOCK **Steel, Length**		**I**	
• Inch, up to 4 inches	± (1.6+ 0.8L) µinch (L in inches) or ± 2 µinch, whichever greater		See note 1
• Inch, 5 to 10 inches	± (5 + 3L) µinch (L in inches)		
• Inch, 12 to 20 inches	± 47 µinch		
• Metric, up to 100 mm	± (0.041+ 0.0008L) µm (L in mm) or ± 0.05 µm, whichever greater		
• Metric, 125 to 250 mm	± (0.127+ 0.003L) µm (L in mm)		
• Metric, 300 to 500 mm	± 1.2 µm		
GAUGE BLOCK **Ceramic, Length**		**I**	
• Inch, up to 4 inches	± (1.6+ 0.7L) µinch (L in inches) or ± 2 µinch, whichever greater		See note 1
• Metric, up to 100 mm	± (0.04+ 0.0007L) µm (L in mm) or ± 0.05 µm, whichever greater		
GAUGE BLOCK		**I**	
• Variation in length (parallelism)	± 1 µinch or ± 0.025 µm		See note 2
HEIGHT GAUGE		**II**	
• Inch, up to 40 inches	± (51+ 2.0L) µinch (L in inches)		See note 3
• Metric, up to 1000 mm	± (1.3+ 0.002L) µm (L in mm)		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
MICROMETER HEAD		**II**	
• Inch, up to 2 inches	± 30 µinch		See note 3
• Metric, up to 50 mm	± 0.6 µm		
MICROMETER Outside		**II**	
• Inch, up to 6 inches	± (45 + 2L) µinch (L in inches)		
• Inch, > 6 to 20 inches	± (50 + 4.2L) µinch (L in inches)		See note 3
• Metric, up to 500 mm	± (1.0 + 0.0042L) µm (L in mm)		
MICROMETER Depth		**II**	
• Inch, up to 6 inches	± (45 + 2.2L) µinch (L in inches)		
• Inch, > 6 to 12 inches	± (55 + 3.8L) µinch (L in inches)		See note 3
• Metric, up to 300 mm	± (1.1 + 0.0036L) µm (L in mm)		
MICROMETER Tubular inside		**II**	
• Inch, up to 2 inches	± (50 + 0.8L) µinch (L in inches)		
• Inch, > 2 to 24 inches	± (60 + 4.4L) µinch (L in inches)		See note 3
• Metric, up to 600 mm	± (1.0 + 0.005L) µm (L in mm)		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
MICROMETER **Three point internal**		**II**	
• Inch, up to 7 inches	± (75+1.6L) µinch (L in inches)		See note 3
• Metric, up to 175 mm	± (1.3+0.0032L) µm (L in mm)		
INDICATOR TESTER		**II**	
• Inch, up to 1 inch	± 30 µinch		See note 3
• Metric, up to 25 mm	± 0.6 µm		
BORE GAUGE (2 points)		**II**	
• Inch, up to 4 inches	± (50 + 0.3L) µinch (L in inches)		See note 3
• Metric, up to 100 mm	± (1.1 + 0.0006L) µm (L in mm)		
INDICATOR, DIAL		**II**	
• Inch, 0.00005 inch graduations	± 14 µinch		Up to 4 inch travel
• Inch, 0.0001 inch graduations	± 20 µinch		
• Metric, 0.001 mm graduations	± 0.3 µm		Up to 100 mm travel
• Metric, 0.002 mm graduations	± 0.4 µm		
• Metric, 0.02 mm graduations	± 3.0 µm		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
INDICATOR, DIGITAL		**II**	
• Inch, 0.00005 inch resolution	± 30 µinch		Up to 4 inch travel
• Metric, 0.0005 mm resolution	± 0.4 µm		Up to 100 mm travel
• Metric, 0.001 mm resolution	± 0.7 µm		
• Metric, 0.01 mm resolution	± 5.8 µm		
CALIPER **Outside, Inside and Depth**		**II**	
• Inch, up to 24 inches	± (290+1.6L) µinch (L in inches)		
• Inch, > 24 to 40 inches 0.0005 inch resolution 0.001 inch resolution	 ± (400+14L) µinch (L in inches) ± (1000+10L) µinch (L in inches)		
• Metric, up to 600 mm	± (5.8+0.002L) µm (L in mm)		See note 1
• Metric, > 600 to 1000 mm 0.01 mm resolution 0.02 mm resolution	 ± (7.5+0.014L) µm (L in mm) ± (20+0.010L) µm (L in mm)		
DEPTH GAUGE **Dial Caliper Type**		**II**	
• Inch, up to 12 inches	± 0.0024 inch		See note 3
• Metric, up to 300 mm	± 60 µm		
Dial Indicator Type		**II**	
• Inch, up to 12 inches	± 580 µinch		See note 3
• Metric, up to 300 mm	± 12 µm		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
DEPTH GAUGE		**II**	
Digital Caliper Type			
• Inch, up to 12 inches	± 290 µinch		See note 3
• Metric, up to 300 mm	± 6 µm		
Digital Indicator Type		**II**	
• Inch, up to 12 inches	± (30+2L) µinch (L in inches)		See note 3
• Metric, up to 300 mm	± (0.6+0.0025L) µm (L in mm)		
Vernier Caliper Type		**II**	
• Inch, up to 12 inches	± 1200 µinch		See note 3
• Metric, up to 300 mm	± 24 µm		
EXTERNAL CALIPER GAUGE		**II**	
• Inch, up to 4 inches			See note 1
0.0002 inch resolution	± 120 µinch		
0.0005 inch resolution	± 290 µinch		
0.001 inch resolution	± 580 µinch		
0.002 inch resolution	± 1200 µinch		
0.005 inch resolution	± 2900 µinch		
• Metric, up to 100 mm			
0.005 mm resolution	± 2.9 µm		
0.01 mm resolution	± 5.8 µm		
0.02 mm resolution	± 12 µm		
0.05 mm resolution	± 29 µm		
0.1 mm resolution	± 58 µm		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
INTERNAL CALIPER GAUGE		**II**	
• Inch, up to 4 inches			
0.0002 inch resolution	± 120 µinch		
0.0005 inch resolution	± 290 µinch		
0.001 inch resolution	± 580 µinch		See note 1
• Metric, up to 100 mm			
0.005 mm resolution	± 2.9 µm		
0.01 mm resolution	± 5.8 µm		
0.02 mm resolution	± 12 µm		
THICKNESS GAUGE		**II**	
• Inch, up to 1 inch	± 290 µinch		See note 3
• Metric, up to 25 mm	± 5.8 µm		
PROFILE PROJECTOR		**III**	
• Linearity of movement			
Digital readout type	± (1.6+0.021L) µm (L in mm)		
Micrometer head type	± (1.6+0.017L) µm (L in mm)		
• Magnification error	± (13+0.017L) µm (L in mm)		See note 3
• Squareness of stage	± 0.7 µm		On-site calibration available.
• Eccentricity of screen rotation	± 1.6 µm		
• Parallelism of stage	± 1.7 µm		
• Accuracy of edge finder	± 1.0 µm		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
I-CHECKER		**II**	
25 to 100 mm	(0.13+.0027L) µm , L is in mm		See note 1
1 to 4 inches	(5.1+2.7L) µinch , L is in inch		
Mu-CHECKER		**II**	
Graduation			
0.1 µm	0.3 µm		
0.5 µm	0.3 µm		
1 µm	0.4 µm		
5 µm	1.5 µm		
10 µm	2.9 µm		
50 µm	15 µm		See note 1
0.000005 inch	10 µinch		
0.00001 inch	10 µinch		
0.00005 inch	17 µinch		
0.0001 inch	30 µinch		
0.0005 inch	150 µinch		
0.001 inch	290 µinch		
RISER BLOCK		**II**	
150 to 600 mm	(0.4 + 0.002L) µm , L is in mm		See note 1
6 to 24 inches	(16 + 2L) µinch , L is in inch		
HEIGHT MASTERS		**II**	
Up to 300 mm	(0.5 + 0.002L) µm , L is in mm		See note 1
Up to 12 inches	(20 + 2L) µinch , L is in inch		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
STEP GAUGE (Checkmaster)		II	
Up to 1010 mm	(0.39 + 0.0014L) µm where L is the length in mm		
> 1010 up to 1710 mm	(0.61 + 0.0018L) µm where L is the length in mm		See note 13.
Up to 40 inch	(15.4 + 1.4L) µinch where L is the length in inches		
> 40 Inch up to 70 Inch	(24 + 1.8L) µinch where L is the length in inches		
MICROMETER STANDARD		II	
5 to 500 mm	(0.32 + 0.002L) µm where L is the length in mm		
> 500 up to 1000 mm	(0.69 + 0.004L) µm where L is the length in mm		See note 13.
0.2 to 20 inches	(12.6 + 2L) µinch where L is the length in inches		
> 20 up to 40 inches	(27.2 + 4L) µinch where L is the length in inches		
FLATNESS for granite or steel surfaces requiring an accuracy of greater than 0.4 µm		II	
1 x 1 mm to 900 x 1000 mm	(0.34 + 0.002L) µm where L is the maximum length in mm		
0.04 x 0.04 inch to 35 x 40 inch	(13 + 2L) µinch where L is the maximum length in inches		See note 15.
CYLINDRICAL RING GAUGE, diameter		II	
3 to 500 mm	(0.46 + 0.002D) µm where D is the diameter in mm		See note 13.
0.12 to 20 inches	(18.1 + 2.0D) µinch where D is the diameter in inches		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
CYLINDRICAL PLUG GAUGES, diameter		II	
3 to 500 mm	(0.30 + .002D) µm where D is the diameter in mm		See note 13.
0.12 to 20 inches	(11.8 + 2.0D) µinch where D is the diameter in inches		
TEST SPHERES - DIAMETER		II	
8 to 50 mm	± 0.4 µm		See note 13.
0.3 to 2 inches	±16 µinch		
TEST SPHERES - FORM		II	
8 to 50 mm	(0.05 + 0.007R) µm where R is the measured roundness in µm		See note 14.
0.3 to 2 inches	(2.0 + 0.007R) µinch where R is the measured roundness in µinch		
ROUNDNESS		II	
Diameter of 2 to 200 mm	(0.05 + 0.007R) µm where R is the measured roundness in µm		See note 14.
Diameter of 0.8 to 8 inches	(2.0 + 0.007R) µinch where R is the measured roundness in µinch		
PRECISION SQUARES		II	
50 to 800 mm	(0.3 + 0.003L) µm where L is the length in mm		See note 15.
2 to 32 inch	(12 + 3L) µinch where L is the length in inches		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
PARALLELS - granite or steel		II	
5 to 1000 mm:			
Parallelism	(0.33 + 0.002L) µm where L is the length in mm		
Width	(0.83 + 0.001L) µm where L is the length in mm		See note 13.
0.2 to 40 inches:			
Parallelism	(13.0 + 2L) µinch where L is the length in inches		
Width	(32.7 + 1.0L) µinch where L is the length in inches		
COORDINATE MEASURING MACHINES (CMM)		**III**	
Acceptance and reverification tests for CMM – CMMs used for measuring size.			On-site services as per ISO 10360-2 second edition 2001-12-15. See note 9.
Error of Indication:			
0 to 1.5 m	± (0.12 + 0.00004L) µm where L is the length in mm		See note 10.
0 to 40 m	± (0.16 + 0.0006L) µm where L is the length in mm		See note 11.
Probing Error:			
10 to 50 mm in sphere diameter	0.14 µm		See note 12.
SURFACE ROUGHNESS		**II**	
Ra up to 4.1 µm:			
Ra	0.07 µm		
Rmax, Ry	0.29 µm		See note 16
Ra up to 160 µinches:			
Ra	3 µinches		
Rmax, Ry	11 µinches		

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Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (see Supplementary Notes)	Type	Remarks
HARDNESS **Indirect verification of Rockwell hardness testers** • HRA • HRB • HRC • HRD • HRE	Governed by the uncertainty of the standardized test block used to perform the indirect verification	**III**	ASTM E18 Standardized Test Blocks per ASTM E18 See notes 4, 7 and 8. On-site calibration available.
Indirect verification of Rockwell Superficial hardness testers • HR15T • HR30T • HR15N • HR30N	Governed by the uncertainty of the standardized test block used to perform the indirect verification	**III**	ASTM E18 Standardized Test Blocks per ASTM E18 See notes 4, 7 and 8. On-site calibration available.
Indirect verification of Vickers and Knoop micro indentation hardness testers • HV • HK	Governed by the uncertainty of the standardized test block used to perform the indirect verification	**III**	ASTM E384 Standardized Test Blocks per ASTM E384 See notes 5, 7 and 8. On-site calibration available.
Indirect verification of Vickers hardness testers • HV	Governed by the uncertainty of the standardized test block used to perform the indirect verification	**III**	ASTM E92 Standardized Test Blocks per ASTM E92 See notes 6, 7 and 8. On-site calibration available.
Indirect verification of Rockwell and Vickers portable hardness testers • HRC • HV	Governed by the uncertainty of the standardized test block used to perform the indirect verification	**III**	ASTM E18 and E92 Standardized Test Blocks per ASTM E18 & E92 See notes 4, 6, 7 and 8. On-site calibration available.

Notes

1. The Best Measurement Capability (BMC) listed can be achieved only if the standards being calibrated are suitable for such a measurement. The uncertainty stated on a calibration report will reflect the uncertainty contribution of the standards that were calibrated.
2. This measured quantity is commonly known as parallelism of gauge blocks.
3. The Best Measurement Capability listed is based on the calibration of an instrument with a resolution of 0.001 mm. The uncertainty stated on the calibration report will reflect the uncertainty contribution of the specific instrument that was calibrated.
4. The Indirect Verification of Rockwell Hardness Testers and Rockwell Superficial Hardness Testers is performed according to the requirements of ASTM E18.
5. The Indirect Verification of Knoop and Vickers Micro Hardness Testers is performed according to the requirements of ASTM E384.
6. The Indirect Verification of Vickers Hardness Testers is performed according to the requirements of ASTM E92.
7. ASTM E18, E384 and E92 are published by the American Society for Testing and Materials.
8. The uncertainty of the hardness tester being calibrated is calculated for each specific test point and is dependant on the uncertainty of the specific hardness test block used and on the performance characteristics of the hardness tester itself.
9. The conformance to specification of the CMM is made in accordance with ISO 14253-1 taking into account all test measurement uncertainties.
10. This BMC is obtained using a low expansion artefact being at least 66% of the longest spatial diagonal of the measuring volume of the CMM, and the shortest size being less that 30 mm, over a temperature ranging from 19.5 to 20.5 °C.
11. This BMC is obtained using a laser interferometer measuring technique, over a temperature ranging from 19.5 to 20.5 °C.
12. The reference sphere supplied with the CMM will not be used for this test.
13. Calibrated in comparison with traceable standards using a Legex CMM.
14. Calibrated in comparison with traceable standards using a roundness tester.
15. Calibrated using a Legex CMM.
16. ASME B46.1

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Supplementary Notes

A. Calibration capabilities are traceable to the national measurement standards of Canada held or accepted by the National Research Council (NRC) or, with the agreement of NRC, to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

B. The laboratory's specific measurement capabilities are certified by the NRC's Calibration Laboratory Assessment Service (CLAS) and accredited by the Standards Council of Canada (SCC) in accordance with the following definitions:

Type I: A capability of which the primary purpose is the calibration of measurement standards for other calibration laboratories. A laboratory with this type of capability has the appropriate reference standards, working standards, check standards, and calibration systems to be able to assess dynamically and to quantify its measurement uncertainty, and is able to monitor its measurement processes continually. The environmental conditions that affect the laboratory's measurements are closely monitored and controlled. A laboratory with this type of capability usually reports a measurement value accompanied by a comprehensive statement of uncertainty. A laboratory with this type of capability is often referred to as a standards or standards calibration laboratory.

Type II: A capability of which the main purpose is the calibration and adjustment of test, measurement and diagnostic equipment for use in product testing, manufacturing, servicing, etc. A laboratory with this type of capability has the appropriate working standards and calibration systems to be able to calibrate to a manufacturer's specification and tolerance or calibrate to a written standard, using appropriate test uncertainty ratios (TUR). A laboratory with this type of capability usually reports a measurement value and indicates if the test equipment complies with a specification, tolerance or a written standard. It will, usually, base its capabilities on the specifications and tolerances of the working standards being used. It also has, normally, the means to check its working standards between calibrations and has available the appropriate environment(s). A laboratory with this type of capability is often referred to as a test equipment calibration laboratory.

Type III: A calibration capability, within a laboratory, mobile or fixed, with the appropriate reference or working standards, of which the main purpose is to provide a reference. A laboratory with this type of capability usually has minimal means to monitor its calibration system. It relies mainly on the values assigned by higher echelon laboratories to its standards and uses these values with few other considerations to assign values or verify the compliance of equipment being calibrated to their specifications and tolerances or to written standards. This could be an on-site service subject to a wide range of environmental factors.

C. The best measurement capability of the laboratory includes the uncertainty associated with the calibration of the laboratory's reference or transfer standard by NRC, or by a laboratory acceptable to CLAS, uncertainties caused by the transportation of the calibrated reference standard from NRC (or other laboratories) to the laboratory, uncertainties of the calibration process in the laboratory, and uncertainties due to the behaviour of the most ideal available standard or measurement device for a specific measurement technology. These uncertainties include components which could have been evaluated by statistical methods on a series of repeated measurements and which can be characterised by experimental standard deviations. The other components, which can also be characterized by standard deviations, are evaluated from assumed probability distributions based on experience or other information. These have been combined to form an expanded uncertainty $U = ku_c$ with U determined from a combined standard uncertainty u_c and a coverage factor $k = 2$. Since it can be assumed that the probability distribution characterised by the reported result and u_c is approximately normal, the value of a calibrated device can be asserted to lie in the interval represented by the expanded uncertainty U with a level of confidence of approximately 95 percent. The uncertainties quoted do not include the possible effects on the calibrated device of transportation, long term stability or intended use.

D. The uncertainty of a specific calibration by the laboratory can be greater than the best measurement capability because it will include uncertainties due to the actual condition and behaviour of the customer's device during its calibration.

E. CLAS certification and SCC accreditation is the formal recognition of specific calibration capabilities. Neither the NRC nor SCC guarantee the accuracy of individual calibrations by the laboratory.